3. Hardware

3.3 Data storage

Marking Scheme

Q1)

1 mark per device, **1** mark per category

Description of storage device	Name of storage device	Category of storage		
		Primary	Secondary	Off-line
optical media which uses one spiral track; red lasers are used to read and write data on the media surface; makes use of dual-layering technology to increase the storage capacity	DVD			✓
non-volatile memory chip; contents of the chip cannot be altered; it is often used to store the start-up routines in a computer (e.g. the BIOS)	ROM	✓		
optical media which uses concentric tracks to store the data; this allows read and write operations to be carried out at the same time	DVD-RAM	✓		(✓)
non-volatile memory device that uses NAND flash memories (which consist of millions of transistors wired in series on single circuit boards)	Solid State Drive/memory (SSD)		✓	
	(SD/XD card) (USB storage device)			(✓)
optical media that uses blue laser technology to read and write data on the media surface; it uses a single 1.1 mm polycarbonate disc	Blue-ray			✓

[10]

Q2)

(a) RAM
- contains instructions/program/data <u>currently in use</u>

ROM
any **one** from:
- contains the start-up/bootstrap program
- contains/stores the setting for <u>frequency</u> (can't be changed)

Solid state drive
- <u>stores</u> the instructions/program/data (to operate the car)   [3]

(b) 1 mark for device and 1 mark for corresponding reason

Device:
- touch screen
- key pad (NOT keyboard)

Reason:
- easy to use interface
- limited number of options
- small space/space is limited
- other devices such as mouse, keyboard, trackerball, … not suitable   [2]

(c) Any **two** from:
- A solid state drive has no moving parts
- A solid state drive has faster random access
- A solid state drive has a quick start up/shut down time (reduced latency)
- A solid state drive is very small
- A solid state drive is very light
- A solid state drive consumes very little power
- A solid state drive does not generate a lot of heat (therefore safer in this application)   [2]

Q3)

(a) – Memory card / SSD / HDD / magnetic tape
     – Suitable description of device given   [2]

(b) 2 hours = 120 minutes
     120 × 180 = 21 600
     21 600 / 1024 (or 21 600 / 1000)
     = 21.1 GB (or 21.6 GB)

     (1 mark for correct answer and 1 mark for correct calculation)   [2]

Q4)

(a) **1** mark for each correct row

	Single track	Many concentric tracks	Blue laser used to read/ write data	Red laser used to read/ write data	
DVD-RW	✓			✓	1 mark
DVD-RAM		✓		✓	1 mark
CD-ROM	✓			✓	1 mark
Blu-ray disc	✓		✓		1 mark

[4]

(b) (i) Any **three** from:

- don't need to "get up to speed" to work properly/no latency
- lower/less power consumption/more energy efficient
- run cooler
- run quieter
- data access is faster
- occupies less physical space/more compact
- lighter, so more suitable for a portable computer/laptop
- no moving parts so more reliable/durable in a portable computer/laptop   [3]

(ii) Any **two** from:

- HDD is cheaper for larger amounts of storage space
- HDD has greater longevity for read/write functions
- Expensive to change the technology // HDD are trusted technology
- No requirement for the increased speed of SSD   [2]

Q5)

1 mark for each correct storage device

ROM (not EPROM/PROM)
Blu-ray disc
RAM
DVD/ DVD-R(+R)/ DVD-RW(+RW)/ DVD-ROM (not CD or DVD-RAM)
SSD/example of a USB <u>storage device</u>
DVD-RAM

[6]

Q6)

Any **four** from:

- reaches maximum brightness quickly
- colours are vivid
- good colour definition/contrast can be achieved
- screens can be thinner/thin
- more reliable as LED's are long lasting
- consume very little/less energy

[4]

Q7)

Question	Answer	Marks
	∞ Secondary ∞ HDD/SSD ∞ SSD/HDD ∞ Primary ∞ ROM/RAM ∞ RAM/ROM	6

Q8)

Question	Answer	Marks

	2 marks for each type of storage
	
	Primary storage
	  ∞ RAM
	  ∞ ROM
	
	Secondary storage
	  ∞ hard disk drive (HDD)
	  ∞ solid state drive (SSD)
	
	Off-line storage e.g.
	  ∞ CD
	  ∞ DVD
	  ∞ Blu-ray
	  ∞ Flash memory // USB storage
	  ∞ removable / external / portable hard disk drive (HDD/SSD)
	  ∞ SD card
		6

Q9)

Question	Answer	Marks

(a)	Any **four** from:
	   – (Red) laser is used
	   – (Laser beams) shines onto surface of the disk
	   – It is rotated (at a constant speed) to be read
	   – Surface is covered in a track (that spirals from the centre)
	   – Data is represented on the surface using pits and lands
	   – Pits and lands represent binary values
	   – Pits reflect light back differently (to the area in between/land)
	   – Optical device can determine the binary value from the light reflection
		4

(b)	1 mark for calculation, 1 mark for correct answer:
	
	   – 1000×16
	   – $16000/8$
	
	   – Answer is **2000** bytes
		2

(c)	**Four** from: (Max 2 for either primary or secondary)
	
	   – Primary RAM and ROM
	   – Secondary HDD and SSD
	
	   – Primary is directly accessible by CPU
	   – Secondary is not directly accessible by CPU
	
	   – Primary is internal to computer
	   – Secondary can be internal **or** external to the computer
	
	   – Primary stores boot up instructions **and** can hold data whilst being processed
	   – Secondary stores files/software
	
	   – Primary has faster access speed
	   – Secondary has a slower access speed
	
	   – Primary has both volatile **and** non-volatile
	   – Secondary is non-volatile
		4

Q10)

Question	Answer	Marks
	1 mark for each correct category: *HDD* – Secondary *RAM* – Primary *ROM* – Primary *CD-ROM* – Off-line *SSD* – Secondary *DVD-RAM* – Off-line	6

Q11)

Question	Answer	Marks
(a)	1 mark for correct calculation method, 1 mark for correct answer: ∞ 2048/1024 (or 1024 × 2) ∞ 2 GB	2
(b)	∝ Instructions/programs/data ∞ … currently in use	2
(c)	Any **three** from: ∞ RAM is volatile, ROM is non-volatile ∞ RAM is temporary, ROM is (semi) permanent ∞ RAM normally has a larger capacity than ROM ∞ RAM can be edited ROM cannot be edited // Data can be read from and written to RAM, ROM can only be read from.	3

Q12)

Question	Answer	Marks
	Any **three** from: – Optical media – Non-volatile – Offline – Single (continuous spiral) track – Data stored using lands / pits – Read using (red) lasers – Can be read only (R) or read write (RW)	3

Q13)

Question	Answer	Marks
(a)	1 mark for the correct tick for each storage	5

Storage device or media	Primary (✔)	Secondary (✔)	Off-line (✔)
External HDD			✓
RAM	✓		
Internal SSD		✓	
ROM	✓		
DVD			✓

Question	Answer	Marks
(b)	**Four** from: ∞ The disc is rotated/spun ∞ Laser beam is used ∞ The laser beam makes indentations on the surface of the disc/pits and lands ∞ The data is written in a spiral/concentric tracks ∞ The pits and lands represent binary values/1s and 0s ∞ It is called burning data to the disc	4
(c)(i)	Solid state	1
(c)(ii)	**Two** from: ∞ It has no moving parts so will be durable ∞ It is small/compact so it can be easily fit onto the device ∞ It is light so it will not be difficult to lift for the drone ∞ It can hold the large amount of data needed for the video/film footage ∞ Uses less power so drone battery will last longer	2

Q14)

Question	Answer	Marks
(a)	1 mark for each correct tick (✔)	3

Statement	RAM (✔)	ROM (✔)
Stores the programs and data that are currently in use	✓	
Used to boot up the computer when power is turned on		✓
Contents are retained when power is turned off		✓

Question	Answer	Marks
(b)	Primary	1
(c)	**Two** from: ∞ Non-volatile storage ∞ Storage that can be disconnected/removed from the computer ∞ Any suitable example ∞ Must be (physically) connected to computer to obtain stored data ∞ Used to store files as a backup	2

Q15)

Question	Answer	Marks
(a)	**Four** from (max 2 marks per improvement): • Make the password require more characters • Makes the password harder to crack/guess • More possible combinations for the password • Make the password require different types of characters • Makes the password harder to crack/guess • More possible combinations for the password • Use a biometric device • Hard to fake a person's biological data // data is **unique** • Two-step verification // Two factor-authentication • Adds an additional level to hack • Have to have the set device for the code to receive it • Drop-down boxes // onscreen keyboard • To prevent passwords being obtained using keylogger • Request random characters • Won't reveal entire password • Set number of password attempts • Will lock account if attempting to guess • Will stop brute-force attacks	4

Question	Answer	Marks
(b)	**Four** from (max 3 marks for benefits only, without an explanation): • More read/write cycles (over its lifetime) // greater longevity … • … likely to be a lot of read/write functions each day • Read/write speed is sufficient … • … even though it is slower than solid-state • Cheaper **per unit of data** stored … • … better value for the company to purchase • … so the law company can afford to buy a server with greater storage capacity • No requirement for portability … • … as a server, it does not need to be moved • Trusted technology … • … it has been traditionally used for many years	4
(c)	• DVD • CD • Blu-ray	3

Q16)

Question	Answer	Marks
(a)	**Two** from: – It is non-volatile – Can be easily disconnected from the computer – It is not directly accessed by the CPU – Suitable example e.g. CD, DVD, USB flash memory	2
(b)(i)	**One** from: – ROM – RAM	1
(b)(ii)	**Two** from: – HDD – SSD – Flash memory	2

Q17)

Question	Answer	Marks
(a)	**Two** from e.g.: – DVD uses red **laser**/light whereas blu-ray uses **blue**/violet laser/light – DVD has a **smaller** (storage) capacity // Blu-ray has a **larger** (storage) capacity – DVD has **two layers** (of polycarbonate) whereas Blu-ray disks have a **single layer** (of polycarbonate) – DVD has a **slower transfer** rate (of approximately 10 mbps) // Blu-ray has a **faster transfer** rate (of approximately 36 mbps)	2
(b)(i)	2 marks for any two correct stages of working, 1 mark for correct answer. – 500 * 300 * 10 // 150 000 *10 – * 8 then ÷ 8 (anywhere in the process) – 1 500 000 ÷ 1024 ÷ 1024 // 1 500 000 ÷ 1 048 576 – = 1.43 MB	3
(b)(ii)	**Four** from: – **Rollers** are used to move the paper through the printer – **Nozzles** spray/drop/jet ink onto the paper – Ink jets/print head/nozzles are moved across the paper (to distribute the ink) – Different colour inks are mixed to create required colours – Technology could be piezoelectric – Technology could be thermal bubble – **Ink** is heated – … and expands/evaporates into a bubble – Bubble is pushed through the nozzle on to the paper – … then the bubble collapses – Electrical current is applied to a crystal – … which makes it vibrate – … which forces a droplet of ink through the nozzle	4

Q18)

Question	Answer	Marks
(a)	**RAM** ∞ To store the data / instructions / parts of OS that are currently in use **ROM** ∞ To store the firmware / bootup instructions / BIOS **SSD** ∞ To store files / software // by example	3
(b)	**Two** from: ∞ It is more durable // it has no moving parts ∞ It has a faster read / write / access speed ∞ It is more compact / light weight / smaller / portable ∞ It uses less energy // battery will last longer ∞ It is quieter ∞ Not affected by magnetic forces ∞ It runs at a cooler temperature ∞ Less latency // takes less time to warm up	2

Q19)

Question	Answer			Marks
(a)	**Statement**	**HDD (✔)**	**SSD (✔)**	6
	It has a limited number of read/write cycles		✓	
	It uses magnetic properties to store data	✓		
	It has moving parts	✓		
	It is non-volatile storage	✓	✓	
	It can be used as an external storage device to back-up data	✓	✓	
	It uses flash memory to store data		✓	

Question	Answer	Marks
(b)	Any **two** from: – CD (drive) – DVD (drive) – Blu-ray (drive)	2

Q20)

Question	Answer	Marks
(a)	Any **four** from: – Stock control system has a database of stock – Each product has a (unique) barcode – Barcode is scanned, and product looked up in database – Stock levels for product are reduced (by 1) – Stock is checked against minimum level – If stock at/below minimum level an order is placed – When stock is re-ordered flag is reset	4
(b)	– It has RAM to store the data / programs / by example **currently in use** – It has ROM to permanently store the boot up instructions – It has HDD to store the stock database / software / OS / by example	3
(c)	Any **four** from: – MAR – MDR – PC – ALU – CU – ACC – CIR – Buses – Registers	4

Q21)

Question	Answer	Marks
(a)(i)	Any **three** from: – Loss of power/electricity – Spillage of liquids – Flood – Fire – Human error – Hardware failure – Software failure NOTE: Three different types of human error can be awarded e.g. accidental deletion, not saving data, incorrect shutdown procedure	3
(a)(ii)	– Create a backup	1
(b)	Max **three** from: – Solid state drive – Non-volatile – Secondary storage – Flash memory – Has no mechanical/moving parts – Uses transistors – … and cells that are laid out in a grid – Uses control gates and floating gates – Can be NAND/NOR (technology) – Use EEPROM technology Max **two** from: – Stores data by flashing it onto the chips – Data stored by controlling the flow of electrons **through/using transistors/chips/gates** – The electric current reaches the control gate and flows through the floating gate to be stored – When data is stored the transistor is converted from 1 to 0	4

Question	Answer	Marks
(c)	**One** mark for each correct row:	6

Statement	Blu-ray (✔)	CD (✔)	DVD (✔)
A type of optical storage	✔	✔	✔
Has the largest storage capacity	✔		
Can be dual layer	✔		✔
Read using a red laser		✔	✔
Has the smallest storage capacity		✔	
Stores data in a spiral track	✔	✔	✔

Q22)

Question	Answer	Marks
(a)	Any **three** from: – Both need a **red** laser to read/write data – Both are spun to be read – Both use spiral tracks for data – Both are optical storage – Both are off-line storage // both non-volatile – Both use pits and lands to store data	3
(b)	Any **one** from: – DVD can be dual layer, but CD can only be single – DVD has higher storage capacity – DVD has a shorter wavelength laser – DVD are spun faster – DVDs have a higher data transfer rate	1

Q23)

Question	Answer	Marks
(a)	Any **three** from: – Keyboard – Mouse – Microphone – Keypad – Touchscreen – Touchpad	3

Question	Answer				Marks
(b)	One mark for each correct row.				6

Statement	HDD (✓)	SSD (✓)	USB flash memory drive (✓)
it has no moving parts		✓	✓
it is non-volatile	✓	✓	✓
it can use NAND gates to store data		✓	✓
it uses magnetic properties to store data	✓		
it has the smallest physical size			✓
it has the slowest read/write speeds	✓		

Q24)

Question	Answer	Marks
(a)	One mark per each correct row.	6

Statement	Magnetic (✓)	Solid state (✓)	Optical (✓)
no moving parts are used to store data		✓	
pits and lands are used to store data			✓
data is stored on platters	✓		
flash memory is used to store data		✓	
parts are rotated to store data	✓		✓
data can be stored permanently	✓	✓	✓

Question	Answer	Marks
(b)(i)	Any **one** from: – Hard disk drive // HDD – Magnetic tape	1

Question	Answer	Marks
(b)(ii)	Any **one** from: – CD – DVD – Blu-ray disk	1
(b)(iii)	**One** for type of storage, **two** for matching justification from: – Magnetic // HDD – (Web server) is likely to receive many requests a day – (Web server) will likely need to store a lot of data and magnetic is high capacity – Magnetic is **cheaper** to buy for **storage per unit** than solid state – Magnetic is capable of more of read/write requests **over time** // has more **longevity** // SSD has more limited number of read/write requests (before it is no longer usable) – No requirement for it to be portable, so moving parts does not matter – Solid-state // SSD – (Web server) is likely to receive many requests a day – (Web server) will likely need to store a lot of data and solid-state is high capacity – Solid-state is more energy efficient – Solid-state runs cooler so will not overheat – Solid state has faster read/write speeds to handle volume of traffic	3
(c)	Any **three** from: – Data is flashed onto (silicon) chips – Uses NAND/NOR technology // can use flip-flops – Uses transistors/control gates/floating gates … – … to control the flow of electrons – It is a type of EEPROM technology – When data is stored the transistor is converted from 1 to 0 / 0 to 1 – Writes (and reads) sequentially	3

Q25)

Question	Answer	Marks
(a)	**One** mark per correct storage, **two** marks for justification. – Secondary – It is non-volatile storage – It is not directly accessed by the CPU	3
(b)	Any **four** from: – Uses flash memory – Data is flashed onto (silicon) chips – Uses NAND/NOR technology // Can use flip-flops – Uses transistors/control gates/floating gates … – … to control the flow of electrons – It is a type of EEPROM technology – When data is stored the transistor is converted from 1 to 0 / 0 to 1 – Writes (and reads) sequentially	4

Q26)

Question	Answer	Marks
(b)(i)	• Router	1
(b)(ii)	Any **two** from: • A collection of servers • … that store data in a remote location // that allows data to be accessed remotely • … that are (normally) accessed using an internet connection	2
(b)(iii)	Any **one** from: e.g. • May be **less** secure // by example • May lose access to them if internet connection lost/not available • Reliant on a third party maintaining the hardware // by example • Could incur an extra/ongoing fee/cost	1

Q27)

Question	Answer	Marks
	Any **four** from: • The secondary storage / hard drive can be partitioned to create the virtual memory • … and page B sent to the virtual memory … • … which makes space for page D in RAM • … Once page A / C / D / another page is not required / has been processed • … page B can be sent from the virtual memory back to RAM when it is required	4

Q28)

Question	Answer	Marks
(a)	Any **two** from: – Data is stored on platters – (Platters) are divided into tracks and sectors – Has components that are spun – Data is read/written using a read/write arm – Data is read/written using electromagnets – Magnetic field determines the binary value – It is non-volatile	2
(b)	Any **three** from: – Flashes data onto chips – Uses transistors – Uses NAND/NOR technology – Uses control gates – Uses flow gates – Controls the flow of electrons – It can be volatile or non-volatile	3
(c)	**One** mark for an example in each storage type e.g.: Magnetic – HDD – Magnetic tape – Floppy disk – Magnetic strip Solid state – SSD – USB drive – SD card – RAM Optical – CD – DVD – Blu-ray	3

Q29)

Question	Answer	Marks
(a)(i)	– C	1
(a)(ii)	Any **one** from: – Directly accessed by the CPU – Has both volatile and non-volatile storage	1
(b)	**One** mark for each correct term in the correct order: – Random access memory (RAM) – Hard disk drive (HDD) – Pages – Random access memory (RAM) – Virtual memory // Hard disk drive (HDD)	5

Q30)

Question	Answer	Marks
(a)	– B	1
(b)	**Four** from e.g.: – The data can be accessed from any location – … meaning that employees can work from anywhere with a connection – The **hardware** is **owned/maintained** by a **third party** – … meaning that the company are not responsible for maintaining // meaning the company aren't responsible for its security – Can increase the storage needed easily – … without needing to buy new hardware – Do not need to house the hardware needed – … costs can be saved on the space saved for this – Cloud system will back up the data – … meaning the company does not need to do this	4
(c)	**Two** from e.g.: – Internet connection is needed/needs to be stable … – … and if this is not available/unstable the data cannot be accessed – Employees could be pressured to work outside of hours … – … as they can access the data from any location	2

Q31)

Question	Answer	Marks
(a)	**One** mark for each correct type: <table><tr><th>Type of secondary storage</th><th>Statement</th></tr><tr><td>optical</td><td>data is stored using pits and lands</td></tr><tr><td>solid-state</td><td>data is stored using control gates and floating gates</td></tr><tr><td>magnetic</td><td>data is stored using electromagnets</td></tr><tr><td>optical</td><td>data is stored using a laser</td></tr><tr><td>magnetic</td><td>data is stored on a platter that is divided into tracks and sectors</td></tr></table>	5
(b)	**Four** from: – Primary storage is directly accessible by the CPU – … whereas secondary storage is not directly accessible by the CPU – Primary storage stores the data that is currently in use/for booting the system – … whereas secondary storage stores **user's** files/data/operating system/application software – Primary storage normally has a small capacity – … whereas secondary storage normally has a larger capacity – **Some parts** of primary storage are volatile – … whereas secondary storage is non volatile – **Some parts** of primary storage the data cannot be changed – … whereas data in secondary storage can be changed – Primary storage has faster access speeds to data – … whereas secondary storage has slower access speeds to data	4

Q32)

Question	Answer	Marks
(a)	To store data/files/software **permanently**	1
(b)	Compact disk (CD) Digital versatile disk (DVD) Blu-ray disk	3
(c)	Any **three** from: • To store data **temporarily** • To store data **currently in use** • To store software **currently in use** • Data can be **accessed** faster (than secondary storage) • To speed up the fetch stage (of the fetch-execute cycle)	3

Q33)

Question	Answer	Marks
(a)	Any **two** from: • To store data/files **permanently** • … otherwise, data/programs would need to be downloaded/entered/installed every time the computer was used • To allow **software** to be **installed** on the computer • For the creation of virtual memory	2
(b)	Any **six** from (**Max 3** for one type only): • Solid-state has no moving parts • … optical does have moving parts • Solid-state is faster to **access** data • … optical is slower to **access** data • Solid-state uses less power to operate • … optical uses more power to operate • Solid-state runs quietly • … optical makes more noise • Solid state is more durable/robust • … optical is less durable/robust • Solid state storage has a large storage capacity • … optical has a much smaller limit to its storage capacity • Solid-state is more expensive **per GB** of data • … optical is cheaper **per GB** of data • Solid-state stores data onto silicon chips/transistors using logic (floating/control/NAND/NOR) gates to control the movement of electrons • … optical stores data by using lasers to burning pits and lands onto a disk	6

Q34)

Question	Answer	Marks
	One mark for each correct type of storage. <table><tr><th>type of secondary storage</th><th>statement</th></tr><tr><td>optical</td><td>Pits and lands are created on a reflective surface.</td></tr><tr><td>solid-state</td><td>NAND or NOR technology is used.</td></tr><tr><td>magnetic</td><td>Platters are spun that are divided into tracks and sectors.</td></tr><tr><td>magnetic</td><td>Electromagnets are used to read and write data.</td></tr><tr><td>solid-state</td><td>Transistors are used as control gates and floating gates.</td></tr><tr><td>optical</td><td>A red or blue laser is used to read and write data.</td></tr></table>	6

Q35)

Question	Answer	Marks
(a)	**C**	1
(b)	It is directly accessible by the CPU	1

Q36)

Question	Answer	Marks
(a)	Any **two** from: For example: • Touchscreen • Microphone • Sensor // by example • Biometric device • Button • (Digital) camera	2
(b)	Any **two** from: For example: • Screen • Speaker • LED • Actuator	2

Question	Answer	Marks
`(c)(i)	Any **two** from: • To store data/files **permanently** • … otherwise, data/programs would need to be downloaded/entered/installed every time the smartphone was turned on • To allow **software** to be downloaded/installed on the smartphone // • To store user files • For the creating of <u>virtual memory</u>	2
(c)(ii)	**One** mark for: Solid state Any **Three** from: • It is small/thin in size • … so it would fit easily into the smartphone device • It is lightweight • … so it wouldn't make the smartphone heavy to carry • It has no moving parts • … so it would be durable/robust • … if the smartphone is dropped the data is less likely to be damaged/lost • It has fast read/write speeds • … so it would be quick to load files/software • It runs at a cool temperature • … so it wouldn't make the smartphone hot to hold for the user • It doesn't make a lot of noise • … so it wouldn't ruin the user's experience of listening to music/watching videos • It doesn't require much power • … so it won't drain the battery • It can have a large storage capacity • … so can store files that are multimedia	4

Q37)

Question	Answer	Marks
(a)	Any **two** from: • Touchscreen • Microphone • Button • (Digital) camera • Sensor // by example	2
(b)	Any **one** from: • Screen • Speaker • LED • Actuator	1

Question	Answer	Marks
(c)	Any **two** from: • To **store** the BIOS • To **store** the bootstrap • To help start-up the smart watch // to **store** start-up instructions • To **store** the firmware • For non-volatile storage // to store data **permanently** • To **store data/instructions** that **should not change** (unless needed)	2
(d)(i)	Any **two** from: • A collection of servers • Allows access to data remotely // Stores data in a remote location • Hardware can be owned/managed by a third party • Data storage that is stored/accessed using the internet	2
(d)(ii)	Any **four** from: • No need to maintain the hardware • … the third party is responsible for maintaining the hardware / security of the data • Resources can be increased / decreased (on demand) // Can have unlimited storage capacity • … no need to worry about running out of storage space • … can save cost of **purchase** of **hardware** • Need less/no (secondary) storage space **on the watch** • … watch can remain/is small in size • … costs of watch can be kept lower • Can access the data from **other/any devices** • … if the watch breaks/is lost data is still available	4

Question	Answer	Marks
(e)	Any **two** from: • The watch can only perform a dedicated/limited functions/tasks • … and a general purpose computer performs many/multiple functions • … (this means that) it is an embedded system • You cannot plug in peripherals • You cannot reprogram the smartwatch // Cannot install other software/apps • It would only have a microprocessor // It would not have a CPU	2

Q38)

Question	Answer	Marks
(a)	B	**1**
(b)	**One** mark for correct example. **Two** marks for matching explanation. • **RAM** • To **store** data/instruction that is **currently in use** • To **store** software/programs that are **currently in use** • For volatile storage // to store data **temporarily** • To allow data to be **accessed** directly **by the CPU/processor** // To allow data to be **stored closer** to the **CPU/processor** • **ROM** • To **store** the BIOS • To **store** the bootstrap/bootloader • To **store** start-up instructions • To **store** the firmware • For non-volatile storage // to store data **permanently** • To **store data/instructions** that **should not change** (unless needed) • **Cache** • To **store frequently** used instructions/data • For volatile storage // to store data **temporarily**	**3**